1995

Attribution in context: Acquisition and blocking of invariance seeking action

Paula L. Johnston-Morgan

ATTRIBUTION IN CONTEXT: ACQUISITION AND BLOCKING OF INVARIANCE SEEKING ACTION

A Thesis

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

in

Psychology

---

by

Paula L Johnston-Morgan

June 1995

ATTRIBUTION IN CONTEXT: ACQUISITION AND BLOCKING OF INVARIANCE SEEKING ACTION

A Thesis
Presented to the
Faculty of
California State University,
San Bernardino

---

by

Paula L Johnston-Morgan

June 1995

Approved by:

[redacted]

Robert E. Cramer, Ph.D., Chair, Psychology

3/20/95
Date

[redacted]

Gloria Cowan, Ph.D., Psychology

[redacted]

Laura Kamptner, Ph.D., Psychology

ABSTRACT

The present study examined the effects of background or contextual variables on human social causal judgements. Modern conditioning and attribution research principles were combined to investigate social analogues of acquisition and blocking of causal judgements. As part of the masking task, subjects were asked to play the role of a supervisor and evaluate the efficacy of an employee evaluation system. Fictional worker(s) and a company's production goals were presented to subjects to evaluate the workers' effectiveness in causing the company's level of production. A simple repeated measures analysis were performed on the worker causal ratings, and acquisition effects were not found; however, a familiar acquisition function was revealed when it was discovered that subjects were responding to the varying levels of the company's production. A 3 X 6 Manova performed on the target worker's causal ratings did not evidence blocking. Alternative explanations for the unanticipated findings, and implications for further research were discussed. Heuristically, this study enhances attribution research such that the basic psychological processes involved in clinical judgement may be compared and understood in a contextual situation with those involved in everyday social judgement.

ACKNOWLEDGMENTS

It has been said that Science is a human endeavor. Indeed, if it were not for the support, guidance, and friendship given to me by my Professor, Dr. Robert Cramer, this thesis would not have developed. I am greatly appreciative to Dr. Bob for his ability to provide leadership and encouragement to those (his students) in pursuing and achieving their educational goals. In the sea of statistics and hypothetical constructs, Bob, served many roles, one that comes to mind is an analogy of a "bridge over troubled waters". In addition, I would like to thank my committee members, Dr. Gloria Cowan and Dr. Laura Kamptner, for their support and direction on this project.

Programmatic research yields many voices. Voices of laughter, frustration, tears, and joy. Voices from which ideas are produced, plans are implemented, and revisions are made. These voices are my fellow associates Robin Williams, Jill Kuhn, Jeff Shaeffer, Lia Nieri, and Suzanne Reid. With their combined efforts and talents this project got off the ground and I am thankful in having had the opportunity of working with them. In addition, I would like to specially thank Ken Poarch and Gratice Brown for their technical assistance and guidance with regards to the computer applications used for this research project.

The Voices from my past, which, to a certain degree, encourage my thoughts in the future are from two important people in my life, Mom and Dad. Your continued encouragement, love, and laughter has always been my guiding light.

Finally, this thesis is dedicated in memory of Cynthia Jensen. My Broker, Mentor, and Friend.....she taught me many business transactions, however, the most important is of the humankind...

TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

One purposeful way that people make sense out of the world is through identifying causal connections and by making causal judgements. Events, changes in state, and changes in properties are all explained and thus understood by attribution to their respective causes. The concept of causation is just as fundamental to human understanding as are concepts of object, space, time, quantity, and logic. Perhaps this may be the reason why many Western philosophers have dealt in a systematic way with the ontological and epistemological aspects of causation.

Western ideologies have generally influenced contemporary thinking on causation and this influence has contributed to the development of an area of research and theory in social psychology known as attribution theory (Bunge, 1979; Duval, 1983; Einhorn & Hogarth, 1986; Hewstone, 1989; Schulz, 1982). Of monumental interest in the movement of Western philosophical thinking was a period in the seventeenth century dominated by the British Associationists. The British Associationists viewed human knowledge as a product of impressions processed through our senses. Simple ideas were viewed as irreducible elements of sensory experience, and complex ideas were thought to be built up from simple ideas by a series of learned associations. For example, David Hume's (1962/1739) Treatise of Human Nature, suggested that associative learning and causal judgements depended upon a deterministic process. He developed several rules for causal association: 1) spatiotemporal contiguity, or causes and effects must be contiguous in space and time; 2) temporal priority, or causes must occur prior to their effects; and 3) constant union, or causes and effects must occur together.

Another British Associationist, John Stuart Mill (1872/1973), suggested from his System of Logic that causes "...are the sum total of conditions positive and negative taken together....which being realized, the consequence invariably follows" (Davidson, 1967, pg. 692.) Mill argued that what people ordinarily call the cause is one of these conditions, arbitrarily selected, which becomes inaccurately labelled as "the cause."

Although attribution theory has been defined as the study of perceived causation where attribution refers to the perception or inference of cause (Kelley & Michela, 1980), several researchers have suggested that "attribution theory" is actually a loose term standing for a general perspective and/or problem rather than a theory (Buss, 1978; Medcof, 1990; Medcof, Kelley & Michela, 1980). Moreover, attributional concepts are at the center of contemporary cognitive psychology and have been a major target of critical analyses (Harvey & Weary, 1981). The present research seeks to develop and test a conditioning model which extends research on causal attribution by employing a research approach which Neal Miller (1959) called an "extension of liberalized S-R learning theory".

Utilizing the Rescorla-Wagner model (1972), I tested several novel predictions from Rescorla and Wagner's theory. More specifically, as part of a larger program of learning research, I examined acquisition effects and a phenomenon called "blocking" (Kamin, 1968; 1969). Results from the present research can be used to demonstrate that in accordance with contemporary psychological thinking, including both learning theories (e.g. Rescorla-Wagner, 1972) and cognitive social theories (e.g. Jones & Davis, 1965; Kelley, 1973), causal judgements reflect a predictable selective mechanism. From a broader perspective, the present study can serve as a heuristic device to generate additional hypotheses and experimental studies pertaining to context effects in human causal judgement.

CONTEMPORARY CAUSAL ATTRIBUTION RESEARCH

Theoretical and empirical research on attributional processes have been a major focus of research in social psychology. In fact, Kelley and Michela (1980) reported over 900 publications relevant to attributional processes between 1970 and 1980. Harvey and Weary (1984) found another 400 to 500 relevant papers published between 1978 to 1984. Perhaps one of the many reasons why social psychologists examine this area of research is that attributional processes are closely connected to other social psychological phenomena. For example, our understanding of the causes of behavior are crucial mediators of our actions in the social world. Moreover, our reactions to other people, like altruism, attraction and conformity, depend on our judgements of the causes underlying another person's behavior.

Regularity vs Generative Theory. It can be said that the development and construction of theory is built upon a historical background in methodology and philosophy. Two opposing positions have risen in the treatment of causation. First, regularity-based theories (like Kelley's covariation model and associative learning models) of causation follow from the philosophical principles of logical positivism (Nagel, 1961). Originally, the regularity view of causation was influenced by the work of Hume (1739/1960), who argued that human observers cannot in principle validate the existence of real causal connections, but only observe the repetitive, regular occurrences of independent events. Hume maintained that observers interpret phenomena in terms of one event causing another to the extent that any or all of three conditions occur (i.e. spatiotemporal contiguity, temporal priority, and constant union). Contemporary modifications of the regularity view emphasize notions of necessary and sufficient conditions, and a conditionship analysis of causal connections. This involves the specification of an event occurring either under necessary or sufficient conditions, or both, governing the relationship of two events.

Generative theories, on the other hand, argue that causes actually generate or produce the effect. An example of a generative cause would be an automobile accident which ultimately produces the effect. According to Schultz (1982), generative theories originated from early Western philosophers (i.e. Kant, 1781/1965), with psychological research on causal inference and attribution being primarily influenced by regularity-based theories.
And, the work proposed here follows a "regularity" based position. Indeed, Einhorn and Hogarth (1986) have argued a similar case by stating that attribution theory researchers have followed Kelley (1967) in emphasizing Mill's (1872)

criteria of <u>concomitant variation</u> and <u>method of difference</u>. The rule of "concomitant variation" argues that inferences about the cause determining the effect are more probable when other competing explanations are ruled out. And Mill's "method of difference" states that if an effect is not observed, then the cause will not be present.

Although research on attribution processes has continued to grow over the last decade, it has been argued that there still remains no well accepted set of assumptions or hypotheses, nor general conclusions that fit together in a logical network (Weary, Stanley, & Harvey, 1989). However, the vast majority of attribution studies have developed from the theoretical perspectives of researchers like Heider (1958), Jones and Davis (1965) and Kelley (1967, 1973). The commonalities between these three theories include the following themes: 1) mediation between stimulus and response; 2) active and constructive causal interpretation; 3) and the perspective of the naive perceiver or lay person (Taylor, 1981). Interestingly, they also share a concern with common-sense explanations and answers to the perceiver's questions about why events occur, or about a person's dispositions. Since the major focus of contemporary research has stemmed from Heider (1958), Jones and Davis (1965) and Kelley (1967), a brief review of their major contributions follows.

Surprisingly, the first psychological study on causality did not begin in social psychology, but developed from the investigations of Jean Piaget and A. E. Michotte. Piaget (1930) examined the origin of the idea of causality in children and how children used causal language. Michotte (1946), who was influenced by a Gestalt psychological perspective, studied the perception of causality through the movement and collision of geometrical shapes. Michotte argued that it was possible to experience phenomenal causality directly, but only if the perceiver's total impression of causality was not dissected into pieces by the investigator. This and similar ideas from the Gestalt perspective influenced Fritz Heider's (1958, 1973) thinking regarding causality in the field social psychology.

<u>Fritz Heider "Dispositional Properties"</u>. Heider's contributions to attribution theory include his study of the processes and variables involved in how people make causal attributions (Weary, Stanley, & Harvey, 1989). Initially, Heider (1958) was curious about the processes by which an untrained observer makes sense out of the actions of others. He suggested that ordinary people operate like "naive scientists" when making attributions. More specifically, he argued that people observe an action and then, in an analytical way, they attempt to find the connections among various causes and effects. In searching for these

connections, Heider applied the term "dispositional properties" which dispose objects and events to manifest themselves in certain ways and conditions. Heider further believed that these dispositional properties are the invariances which make for a more or less predictable, stable, controllable world (Heider 1958, pg. 80). Heider also suggested that people are not simply content to register the observances surrounding them, but they refer to the invariances in their environment. The underlying causes of events (like the motives of other people) are the invariances of the environment that are relevant to the individual. This observation fostered one of Heider's many theoretical statements: scientific psychology could be studied from a common sense approach. Put more simply, Heider's (1958) insights suggested an analogy between naive causal analyses and experimental methods because both presume a regularity in events occurring in nature.

Heider (1958) suggested that a person's ability to control the environment depends on the recognition of causal relationships. In other words, to negotiate the external world it is advantageous and even essential to understand which specific events are causing what particular effects. Similarly, Kelley (1973) stated that "causal attribution identifies the causes of certain effects and forms the basis for decisions about how to act in order to bring about the continuance or discontinuance of those effects [p. 127]." Notions of personal control and responsibility for outcomes are closely related to the philosophical ideologies of both critical realists (Harre, 1972) and contemporary learning theorists (Garcia, 1968; Seligman, 1970). For example, the critical realists view looking for causes (i.e., invariance seeking action) as biologically adaptive and therefore may be a part of human genetic makeup. Some learning theorists support a similar notion in terms of an innate biological mechanism located in the organism's central nervous system which functions in the promotion of specific associations biologically relevant to the organism's survival (AKA innate releasing mechanisms). It may be possible that humans are biologically or perhaps socio-logically prepared to associate certain causes and certain effects more readily than others (See Kuhn, 1993). While Heider (1958) acknowledged that "intentionality" was important to the understanding of personal causation, Jones and Davis (1965) extended this concept by attempting to formalize how individuals make inferences about a person's intentions and, in turn, dispositions.

<u>Jones and Davis "Correspondent Inference</u>". Jones and Davis (1965) developed a hypothesis-testing theory known as "Correspondent Inference". Basically, their theory is

concerned with factors that influence an observer's attribution of intent and disposition to another person. However, it does not explain how someone understands his/her own dispositions and intentions (Weary, Stanley, & Harvey, 1989).

Jones and Davis describe a correspondent inference as an inference about an individual's intentions and dispositions that directly results from or corresponds to his/her behaviors. For example, Professor Kenny makes a sarcastic remark to one of his students named Fredrika, leading to some emotional discomfort on her part. We may infer that Professor Kenny is hostile toward Fredrika and intends to abuse her verbally. In this example, the perceiver's attribution of Professor Kenny's intent follows directly from his behavior. Extending from their original hypothesis (Correspondent Inference), Jones and Davis analyzed several factors which may influence the perceiver's inference. They wanted to know what factors would facilitate a perceiver's attribution regarding Professor Kenny's intent. More specifically, was the Professor's sarcastic remark hostile or was no ill will actually intended? A partial explanation provided by Jones and Davis is that the socio-cultural desirability of the viewed behavior is an important determinant of the perceiver's attributions of intent and disposition. According to this view, behavior that is unexpected, or low in desirability, will be more informative to the perceiver and more conducive to a dispositional inference, than behavior that is expected or high in desirability. For example, most societies have underlying social norms, and negative behavior (i.e., behavior contrary to the societal norm) is more informative about the individual than is behavior which is positive or conforms to the norm.

Another determinant of a correspondent inference is <u>non-common effects</u>. According to Jones and Davis (1965), information about the consequences of alternative actions is used to infer the intention behind a particular act. The principle behind non-common effects is that the intention underlying a voluntary act is more clearly evident when it has a small number of effects that are unique to it (i.e., non-common). In other words, non-common effects represent distinctive outcomes that follow from an act. In the previous example, let's say a student named Fredrika is a member of a serious group of students studying in the field of archaeology. On several occasions this group has attended many professional conventions and has participated in several archaeological excavations. Thus, it could be said that the group's activities are "common effects". However, when the supervising Professor (Dr. Kenny) asked his students (including Fredrika) to attend a very important expedition in South America, everyone except Fredrika accepts the invitation. Thus, Fredrika's decision not to go is a non-common effect, relative to the group's decision, since in the past all of Professor Kenny's students have participated in these types of activities. The observers of Fredrika's behavior are more likely to make an dispositional inference regarding her decision. They might infer that Fredrika is not a dedicated student (dispositional attribution), when in fact there may be situational factors present (e. g., family matters). Jones and Davis argued that non-common effects associated with an act, lead to a greater likelihood of a dispositional attribution.

<u>Kelley "Covariation Principle"</u>. Unlike Jones and Davis, Kelley's (1967,1972,1973) research investigated how people make attributions to others and the self. Kelley argued that his theory applies equally well to self-perception as it does to person perception. Extending Heider's original thesis that casual judgements can be examined via the experimental method, Kelley theorized that people make causal attributions as if they were analyzing data patterns by means of an analysis of variance (ANOVA). Thus, Kelley followed Heider (1944) in the use of a version of J. S. Mill's "method of difference": i.e., an effect is attributed to a condition that is present when the effect is present, and absent when the effect is absent. This, Kelley

argued, was the underlying logic of his covariation principle which fundamentally operates in his attributional ANOVA model (Hewstone, 1983). Recall earlier that Hume's third rule on constant union states that causes and effects must occur together. It is interesting to note the similarity between Hume's rule and Kelley's <u>covariation principle</u> that "an effect is attributed to the one of its possible causes with which, over time, it covaries" (Kelley, 1973, p.109).

Kelley's initial interest in attribution was to address the question of what information is used in arriving at casual attributions. Kelley outlined two different attributional situations depending on the amount of information given to the perceiver. He called these two cases <u>covariation</u> and <u>configuration</u>. Under covariation, the perceiver has information from multiple sources and can perceive the covariation of an observed effect and its possible cause. The classes of possible causes are persons, entities (environmental stimuli) and times (occasions or situations). According to Kelley, attributors use three types of information to verify cause and effect relationships. The three types of information: <u>distinctiveness</u>, <u>consistency</u> and <u>consensus</u>.

Utilizing the previous example, lets' say Professor Kenny laughs at a former colleague. Observers, according to

Kelley's Anova model, would make an attribution based upon the information with which it covaries. Presumably, this outcome could be caused by something about the person (Professor Kenny), the stimulus (former colleague), the circumstance (the occasion on which the outcome occurred), or a combination of these factors. Kelley's model suggested that observers use three possible ways to examine variations in effects: 1) over people - do other Professors as a group laugh at this colleague? (consensus information); 2) over stimuli - does Professor Kenny laugh at other colleagues? (distinctiveness information); 3) over time - has Professor Kenny laughed at the same colleague in the past? (consistency information). The covariation principle would suggest that: if only Professor Kenny laughs at the colleague (low consensus), if he also laughs at other colleagues (low distinctiveness), and if he has laughed at this colleague in the past (high consistency), the effect will be attributed to something about the person (Professor Kenny).

Configuration, on the other hand, pertains to the idea that a perceiver must take into account the "configuration" of factors leading to an observed effect. In other words, if the perceiver lacks critical information when multiple causes are present, the perceiver will make attributions based on "causal schemata." Kelley argued that these schemata were built up from experience about how certain types of causes interact to produce specific types of effects.

Kelley outlined two types of causal schemata from which other schemas could be generated. These include multiple sufficient cause (MSC) schema and multiple necessary cause (MNC) schema. Kelley's MSC schema assumes that different causes (e.g., adverse home background, poor school environment and lack of individual effort) produce the same effect (e. g., exam failure). The operation of this schema has been observed in studies demonstrating the "<u>discounting principle</u>": given that different causes produce the same effect, the role of a given cause (e.g., lack of effort) in producing the effect (failure) is attenuated if other plausible causes are present (e.g., problems at home) (Kelley, 1972).

Kelley argued that causes can be inhibitory or facilitative to an effect. For example, to succeed in an exam, problems at home would be seen as an inhibiting cause. In this case the "<u>augmenting principle</u>" might be applied. According to the augmenting principle, the role of certain causes (e.g., individual effort) is augmented when the presence of another cause (e.g., home problems) would be seen to inhibit the effect. Thus, an individual who has home problems and succeeds on an exam may have success attributed more to internal factors (such as effort) than would a student who does not have home problems. Kelley has not explained the details of how and when schemata are used. However, the most common assumption is that lay people make attributions as if they were using schemata to meet the need for a fast, economical analysis (Hewstone, 1983).

The present study will investigate causal judgements using contemporary learning theory as a guide. Since behavior patterns are presumably governed by less complicated mechanisms, the knowledge gained from the investigation of elementary processes (e.g. classical conditioning) can be used to guide the study of more complex behavior systems. Therefore, a brief examination of relevant learning theory and its application towards social causal judgements follows.

LEARNING THEORY

Like attribution researchers early traditional learning theorists were greatly influenced by the ideas and philosophies of the British Associationists (e.g., Hume, Locke, Bacon). For example, the mechanisms by which associations develop in Pavlovian conditioning were thought to occur by the simple pairing or contiguity of antecedent and consequent stimuli (Rescorla, 1988). This historical idea in classical conditioning is reminiscent of Hume's third rule on causality and is conceptually similar to Kelley's covariation principle. It is in this ideological framework that attributional judgements may be related to or follow from associations.

Pavlov's "Overshadowing". Pavlov's work in classical conditioning demonstrated that organisms could learn to make new responses to stimuli and learn about the relations between stimuli. More specifically, the essential features of classical conditioning is a paradigm where an unconditioned stimulus (US) which reliably produces a measurable unconditioned response (UR) is paired with a neutral or conditioned stimulus (CS). As a function of repeated pairings the CS eventually elicits a response in the absence of the US. This response is called a conditioned response (CR). Pavlov described and explained several conditioning phenomena like acquisition and extinction (Schwartz, 1989). However, of particular importance in the development of contemporary thinking in Pavlovian conditioning, was a learning phenomena discovered by Pavlov called overshadowing and inhibition (Mackintosh, 1974; Rescorla, 1971; Schwartz, 1989).

Pavlov's overshadowing phenomena demonstrated that the strength of conditioning to one stimulus depended upon whether it was presented alone or in a stimulus compound. When a compound CS consisting of thermal and tactile stimuli was paired with a US and subjects were tested using each component in isolation, only the more intense CS would elicit the stronger CR's. Hence, Pavlov concluded that the stronger of the two component stimuli would "overshadow" the weaker to a greater or lesser extent dependent on the relative intensities of the two stimuli (Macintosh, 1974).

The implications of overshadowing suggested that the principles of simple contiguity failed to explain this conditioning. If simple contiguity was necessary and sufficient for conditioning to occur, than each CS (the more and less intense) in the compound would have conditioned equally. Although this phenomena was not thoroughly investigated until much later (Kamin, 1968; Wagner, Logan, Haberlandt, & Price, 1968), it began a new era in learning theory by initiating inquiry into the nature of selective association.

Kamin's "Blocking". Support for the general overshadowing effect based on prior experience (blocking) comes from a series of studies by Kamin (1968). Kamin's blocking experiment showed that conditioning of CS (A) with a particular US to asymptote attenuates or blocks the ability of the US to produce conditioning to a new CS (X) when it is introduced to the conditioning situation. In demonstrating the "blocking effect", Kamin (1968, 1969) developed a three phase experimental sequence using a conditioned suppression procedure in rats. During phase one, stimulus (A) is paired with the US in the experimental group while a control group receives no single stimulus conditioning. During phase two the experimental and control group receive conditioning trials in which stimulus (A) is presented in a compound with (X) and paired with the US (AX+). A subsequent test of response strength to stimulus (X) alone indicates that less conditioning occurs to stimulus (X) in the experimental group than in the control group. Arguably, conditioning to (X) was <u>blocked</u> in the experimental group because prior conditioning to (A) reached asymptote thus allowing the US to become ineffective and therefore no new conditioning to (X) could occur.

Overshadowing and blocking effects suggest that a simple CS-US contiguity mechanism fails to capture adequately the relation required to produce an association. Consider for example a real life event. A man goes to a restaurant eats a meal and gets sick. In this situation there are numerous cues most of which fall within the boundaries of temporal contiguity with the effect and could serve as the CS for the man's illness. The plate on which the food was served, the waitress, the background music, could all serve as potential CSs since these stimuli are within the temporal limits necessary for successful Pavlovian conditioning. The question is how, or by what criteria the organism selects one of the stimuli as the CS over other potential cues? This question falls within a general class of problems termed stimulus selection. Rudy and Wagner (1975) describe the stimulus selection problem as "one of specifying the rules whereby a relationship will or will not appear to be learned about depending upon the context of environmental events in which it is embedded (p. 270)".

<u>Rescorla-Wagner's "Stimulus Selection Problem"</u>. In an attempt to address the stimulus selection problem, Rescorla and Wagner (1972) proposed that organisms behave as if they estimate the information embedded in the different stimuli with respect to the probabilities of the US appearance. Theoretically, organisms form selective associations between the US and the stimulus which contains the maximum information about possible occurrence of the US. More specifically, stimuli that covary reliably in the past with the US become better predictors of the US and would therefore be selected as the CS. Based on their predictions, Rescorla and Wagner developed a mathematical model (neo-Hullian) which assumes that the gain in learning on each trial is dependent both on what has been conditioned prior to that trial and the theoretical asymptote of learning a US can support. Rescorla and Wagner's model was able to explain and predict Kamin's blocking effect by

arguing that the associative strengths of component stimuli (A and X) change due to the net combination of the components, not each component separately. In other words, the more significant an effect (US) is on changing the associative strength of a stimulus depends on the existing strength of that stimulus and on other stimuli present. The Rescorla-Wagner model will be presented again in more detail.

SOCIAL LEARNING THEORY

The parallels between simple learning situations previously mentioned and situations within the framework of attribution theory should be apparent. Substitution of the CS (or antecedent stimulus) and the US (or consequent stimulus) by terms like persons and behaviors would produce a typical attribution problem. Recall earlier that Kelley's theoretical analysis of cause-effect judgements were based on contiguity. However, when multiple causes are present (multiple CSs) attribution theory offers explanations like discounting and augmenting, but does not explain the mechanisms governing which cause-effect judgements are made given contextual variation. Initially, learning theory also fell prey to the idea that cause-effect associations were a product of contiguity. However, when compound CSs (or multiple causes) were introduced in conditioning, learning theory advanced by proposing new models and theories to explain and predict contextual variation in stimulus-stimulus associations (e.g., Rescorla-Wagner Model). Thus, it can be argued that the advances made in contemporary learning theory can be applied to guide the present research and to better understand attribution processes.

Alloy and Tabachnik. One of the many ideas from Miller's (1959) approach that the proposed study adopts is the view that basic learning processes found in the laboratory can be applied to explain more complex social phenomena. Consistent with this approach, Alloy and Tabachnik (1984) proposed a theoretical framework for understanding and integrating animal learning phenomena and human covariation judgements. More specifically, they postulated that animals as well as humans perceive event contingencies and that judgements based on covariation are an interactive process between prior expectations about event relationships and current available situational information. According to Alloy and Tabachnik, how an organism makes judgements and/or modifies its behavior depends upon relevant expectations and objective situational information as well as on the degree to which these two sources of information converge (see also Rescorla, 1988).

Shanks and Dickinson. Similarly, Shanks and Dickinson

(1987) have suggested that empirical and theoretical analyses of the impact of event contingencies developed within animal conditioning may illuminate the processes underlying human judgments of causality. They argued that empirical similarities like acquisition functions, contextual blocking and signaling effects found in animal conditioning can be applied to the understanding of human causality judgements. In particular, they suggest that an associative view be applied to human causality judgements.

In demonstrating parallels between animal conditioning and human causal judgements, Shanks and Dickinson (1987) showed that when human subjects are given a task to judge the relationship between an action and an outcome, their judgements are sensitive to contingencies between the probability of the outcome given the action P(O/A) and the probability of the outcome given no action P(O/-A). For example, previous research showed that acquisition and blocking effects occur in human learning (Chapman, 1991; Chapman & Robbins, 1990; Cramer, Weiss, Steigleder, & Balling, 1985; Dickinson, Shanks, & Evenden, 1984; Shanks, 1985). Dickenson et al. (1984) asked subjects to judge the extent to which pressing a key caused an effect to occur on a computer screen. In the first stage of the study, subjects witnessed trials on which an alternative cue (A) reliably predicted the effect. In the second stage, subjects performed the action (A) at the same time as cue (B) occurred, and this combination of potential causes was followed by the effect. Finally, subjects made judgements about the causal relationship between the action and the effect. Dickinson et al. found that the subject's judgements were significantly reduced in the blocking condition compared to the control condition in which cue (B) had not been paired with the effect in the first stage.

Wasserman. In a more recent study, Wasserman (1990) evaluated the parallels between animal associative learning and human causal judgements by exploring the empirical convergence of experimental manipulations in both domains. Wasserman (1974) showed that in his autoshaping procedure with pigeons and in his study with human causal judgements (1990) the functional learning curves of human causal ratings and pigeon keypecks over differential correlations of AX-BX compounds demonstrated a similar pattern. In Wasserman's 1990 study, college students were asked to judge the efficacy of three foods (peanuts, shrimp, and strawberries) in causing a patients's allergic reaction. Food combinations were varied along with the presence or absence of an allergic reaction. Wasserman found that if a subject can predict that shrimp, for example, causes the allergic reaction and peanuts do not, then shrimp is given causal priority. More specifically, shrimp and peanuts have different associative strengths depending upon the differential correlation with the occurrence or non-occurrence of illness. However, if a subject cannot discriminate whether or not it is the shrimp or the peanuts causing the allergic reaction, then both foods are given causal priority. In essence, both foods have the same associative strength. Consistent with contemporary learning theory, Wasserman has demonstrated that subjects trying to judge an effect from multiple causes use information about the differential predictiveness of each of the stimuli.

The developments in the research mentioned above indicates the possibility that models of elementary associative learning may have explanatory value in human causal judgements. Shanks (1987) and Wasserman (1990) have suggested that historical observations or insights from some of the earliest thinkers in behavior, more specifically, David Hume can inform and inspire research and theory in learning and causal judgments. In fact, according to Hume, "a causal judgment is seen as reflecting no more than the strength of the relevant association between the mental representations of the cause and effect, with the principles governing the attributions being those of associative learning " (Shanks & Dickenson, 1987, p. 230).

In addition, what seems to be common among all the studies previously mentioned is how the perceiver makes causal judgements given information about the differential associative strength or probabilities of potential causes and effects in the causal judgement task. Might not these researchers be addressing the stimulus selection problem? I am arguing that it is possible to address social causal judgements in terms of the stimulus selection problem. That is, given a particular social situation or context, what rule or rules do observers use when attributing a cause to an event? Stating the problem another way, what rules do people use to attribute a particular cause to a particular effect based upon the social context (e.g., the presence of other people) in which these two stimuli are embedded?

STATEMENT OF THE PROBLEM

The present study is part of a program of research designed to test several attribution hypotheses using conditioning variables and analogous variables in social psychology.

Technique of Theory Construction. Through the use of analogy, a relatively well understood conditioning model is used to guide the investigation of a less well understood research area. In particular, analogies will be drawn between classical conditioning independent and dependent variables and variables assumed to be important in the development of social causal judgements. Theoretically, the empirical relationships holding among the variables in the conditioning model should also hold among the corresponding attribution variables (Oppenheimer, 1956; Nagel, 1961).

Rules of Correspondence. Analogies drawn between classical conditioning variables and variables assumed to be important in attribution are as follows: Corresponding to a conditioned stimulus (CS) is a discriminable social stimulus, such as a worker (A) or two workers (AX) or three workers (ABX) (Rule 1). Corresponding to an unconditioned stimulus (US) is a social stimulus, such as a company's production level which elicits "striving for" responses

(Staats, 1975) or our term for cause attribution, invariance-seeking action, (Rule 2) with response so elicited being analogous to an unconditioned response (UR) (Rule 3). The conditioned form of the UR analog (speed, or probability of invariance seeking action) corresponds to a conditioned response (CR) (Rule 4). The number of CS-US pairings (reinforced trials) corresponds to the number of CS analog - US analog pairings an constitute attribution acquisition trials (Rule 5). A trial on which the worker(s) is not followed by the company's production level constitutes an extinction trial (Rule 6). Corresponding to an inhibition procedure is presenting two social CS analogues (one previously paired with the effect of interest (A) and one a novel stimulus (X) not followed by the effect of interest; theoretically stimulus X becomes a conditioned inhibitor of causal attribution (Rule 7). Corresponding to a reinforced compound CS trial is an attribution trial where two or more social stimuli, such as worker (A) and worker (X) are paired with the company's production level (Rule 8). Corresponding to the CS saliency is the saliency or vividness of the CS analog (Rule 9). The power of a social stimulus, such as a company's production level in eliciting invariance seeking action corresponds to the intensity of the US (Rule 10).

Although the rules developed here are illustrative rather than exhaustive, they are sufficiently detailed to permit further theoretical development. The derivation of acquisition and blocking effects follows from the specification of a detailed mechanism for using the Rules of Correspondence.

Rescorla-Wagner Theory. Arguably, the Rescorla-Wagner model can address the stimulus selection problem in causal attribution. More specifically, the Rescorla-Wagner model assumes that the effectiveness of a US in increasing the associative strength of a CS (VA) attenuates as the signal value of the cue increases. Changes in associative value of the CS (Δ VA) are determined by the difference between the cue's current associative strength ($\overline{V}A$) and the theoretical asymptote of conditioning supportable by the US (λ). As the difference between the associative strength of a CS and theoretical asymptote of conditioning ($\lambda - \overline{V}A$) decreases across conditioning trails, increases in the associative strength of the CS will progressively diminish resulting in a negatively accelerated learning curve (acquisition). Stated another way, Rescorla and Wagner (1972) suggest that changes in the associative strength of a CS are not determined by the current strength of that component stimulus alone but the total associative strength of all cues present in the conditioning situation, including context cues. Thus, the theory predicts that conditioning of a neutral CS will be affected by the composite associative strength of all background stimuli contiguous with the US. If the total associative strength of all stimuli is at or near asymptote, the US will be ineffective in conditioning any new cue (blocking).

The Rescorla-Wagner Model (1973) assumes that the associative strength of a compound ($\overline{V}$ AX) is a function of the strengths of the component cues A and X. Rescorla and Wagner also assumed that the associative strengths combined additively: $\overline{V}$ AX = V A + V X, where the value of the theoretical limit on conditioning sets limits on the total strength of the compound. Prior conditioning to stimulus A would be expected to block conditioning to stimulus X if AX were reinforced together. Following the logic presented above, if the asymptote of conditioning is reached by reinforcing A then the difference between the asymptote (λ) and the associative strength of all stimuli ($\overline{V}$AX) present during conditioning will be zero ($\lambda - \overline{V}AX = 0$). Hence, conditioning to X will be attenuated or blocked. From an attribution perspective, prior association of an event to a possible cause (A) reduces the degree to which another plausible cause (X) could be advanced later even though both "causes" appear with the event. This situation mirrors Kamin's "blocking effect".

Hypothesis #1 - Acquisition Effects. Classical conditioning in general, and Rescorla-Wagner theory in particular, suggest that repeatedly pairing a neutral cue (CS) with reinforcement (US) will contribute to the cue's acquisition of associative strength. A negatively accelerated increasing learning curve for the conditioned response (CR) will result. Developing and manipulating analogous attribution independent and dependent variables should produce empirical relationships which are similar to the conditioning relationships. Hence, we predict that repeatedly pairing a single worker (A) with the company meeting its productivity goal will result in the development of stronger casual attributions to the worker. The subject's causal attributions to the worker (invariance seeking actions (ISA) = CR analog) should be evidenced by mapping negatively accelerated ISA responses across evaluation trials. (Rules of Correspondence 1 - 5).

Hypothesis #2 - Blocking Effects. The blocking effect hypothesis is derived from the expectation that conditioning to a single antecedent stimulus takes place in a context containing any number of other stimuli. Rescorla and Wagner demonstrated a stimulus present during conditioning which already reliably signals the unconditioned stimulus, will block or retard conditioning to a new stimulus. Hence, we predict causal attributions to a target stimulus worker X will be blocked if he is paired with the company meeting its productivity goal in the presence of another worker A who reliably predicts production goal attainment. In other words, blocking should be evidenced by weaker casual attributions to the worker X because another worker has a history of being associated with the company meeting its goal. (Rules of Correspondence 1 - 5 and 8).

GENERAL METHOD

Subjects. Sixty female and male subjects were randomly assigned to a blocking group (Group 1) or one of two control groups (Groups 2 and 3). Subjects' gender was balanced within each group. Subjects were recruited from undergraduate psychology courses at California State University, San Bernardino. All subjects were treated in accordance with the Ethical Principles of the American Psychological Association. One male and five female members of the Social Learning Research Group served as experimenters.

Masking Task. It has been argued that the subject's awareness that their behavior is being recorded may distort the validity of the research. Thus, in order to alleviate reactivity biases, a slight deception regarding the true nature of the experiment was necessary. The conditioning experiment was masked by describing it as a study investigating a computerized employee evaluation system. We instructed the subject as follows: "In this study we are interested in testing the efficiency of a computerized employee evaluation system. Your cooperation is appreciated and necessary for examining the usefulness of the automated program. In order to test carefully the effectiveness of the system, it will be necessary for you to assume the role of a production supervisor in a large company." Additional instructions indicated that, "You will be given information about three part-time employees, Sam, Joe, and Ted and their company's level of productivity. After reviewing a monthly productivity report it will be your responsibility as Sam, Joe, and Ted's supervisor to evaluate their performance and how effective they were in causing the company's level of productivity. "Sam, Joe and Ted are college students and are only available to work part-time. However, it is important to evaluate Sam, Joe, and Ted carefully each month because they may be considered for full time employment upon graduation."

In conditioning research the level of the US is typically held constant except where magnitude of the US effects are specifically tested. However, in social learning research holding the level of productivity (US analog) constant is unrealistic. To maintain mundane realism, slight variations in level of productivity were used. More specifically, production levels comprised of 650, 700, and 750 were indicated on a scale from 0 to 1000.

Experimental Design. In classical conditioning a discriminable antecedent stimulus is paired with a discriminable consequent stimulus. In the present study the antecedent stimuli were fictional worker(s) named Sam (**blocking stimulus** or A+), Joe (**target stimulus** or X+), Ted (**neutral stimulus** or B-), and Sam and Joe presented together (**compound stimulus** or AX+). The consequent stimulus was a fictional company meeting its productivity goal. (See Appendix A.) The experiment can be described as a Groups X Trials repeated measures design. The first independent variable was the social context within which the target worker, Joe (X), is paired with the company meeting its productivity goal. Invariance seeking action acquisition trials constituted the second independent variable. The subject's strength of causal attributions to the target stimulus Joe (X+), (i.e., strength of invariance seeking action) constituted the primary dependent variable. Other secondary dependent variables included subject ratings on the following: 1) the extent to which worker X was effective in causing the company to meet its goal; 2) subject's confidence in his/her rating of worker X's effectiveness is causing the company's goal; 3) the effectiveness of worker X's fellow employees causing the company goal to be met.

Apparatus and Materials. Previous research has demonstrated the utility of using a computer to administer the stimulus material when examining causal relationships (See Dickinson, Shanks, & Evenden 1984; Shanks & Dickinson, 1987; Shanks, 1987,1988). Thus, the subject module was controlled using an IBM 386 PC and the software application used was Micro experimental Language (MEL) version 120. This application directed the presentation of the instructions, the antecedent and consequent stimuli, manipulanda, and the employee evaluation scale (EES).

On the computer subject module a key pad numbered 0 to 100 allowed the subjects to rate the worker(s) using a 3 item employee evaluation scale (EES). The EES was designed to measure worker effectiveness following the presentation of the antecedent and consequent stimulus on each conditioning trial. For purposes of clarity, all EES questions were anchored with a value of 0 indicating no attribute to a value of 100 which equals the attribute. The EES contained three items which were as follows: 1) "Given all the information you have received, on the scale below indicate THE EXTENT TO WHICH SAM AND JOE WERE EFFECTIVE in causing the company's level of PRODUCTIVITY." anchored with the phrases <u>totally ineffective</u> and <u>totally effective</u>; 2) "HOW CONFIDENT ARE YOU ABOUT YOUR RATING OF SAM AND JOE as being effective in causing the company's level of productivity." anchored with <u>no confidence</u> to <u>complete confidence</u>; 3) "Given all of the information you have received, indicate THE EXTENT TO WHICH SAM AND JOE'S FELLOW WORKERS ARE EFFECTIVE in causing the company's level of productivity." anchored with <u>totally ineffective</u> to <u>totally effective</u>.

Note: the above items are examples of questions that were presented when the antecedent stimulus is a compound stimulus or presents two workers Sam and Joe (AX). However, when the antecedent stimulus presents one worker, Sam (A+), Joe (X+), or Ted (B-) the EES will ask questions pertaining to the worker that is viewed on that particular trial. The six test trials evaluating the target worker Joe (X+) are of particular importance for testing the hypothesis.

Procedure. Upon entering the laboratory, subjects were asked to read and sign a consent form (see Appendix B). The experimenter then asked the subjects to sit in front of the subject module while s/he activates the MEL program. At the beginning of the program subjects received instructions pertaining to one of the three treatment conditions (see Appendix C). Following the instructions the antecedent stimulus (the workers) appeared for 5 seconds on the left side of the computer monitor. After the antecedent stimulus had been illuminated for 5 seconds, the consequent stimulus was presented and illuminated for 10 seconds on the right side of the computer monitor, with both the antecedent and consequent stimulus extinguishing together after 10 seconds. The entire computer monitor then went blank, and item one from the EES appeared for 15 seconds. Subjects were asked to respond to the item using a computer keypad. After the subject responded evaluation item one went off and item two then appeared on for 15 seconds. This sequence was repeated, in turn, for the remaining third item. After the subjects responded to item three the program recycled to the antecedent stimulus. The cycle was repeated 18 times in Group 1, 12 times in Group 2, and 18 times in Group 3. After the subjects completed the sequence of cycles they were thoroughly debriefed and given the opportunity to have all of their questions answered (see Appendix D).

Group 1 - Blocking (A+/AX+). Subjects were exposed to the antecedent and consequent stimuli a total of 18 times. All 18 trials presented to the subjects were randomly interspersed and consisted of six blocking stimuli (A+) or (worker Sam trials), and six compound stimuli (AX+) or (workers Sam and Joe trials), followed by six target stimuli (X+) or (worker Joe alone trials). Each antecedent stimulus was followed by the consequent stimulus or company goal production level. After each antecedent and consequent stimulus presentation, the subjects responded to the EES.

Group 2 - Control (AX+). Subjects in Group 2 were treated similarly to subjects in Group 1 except the antecedent and consequent stimuli were presented a total of 12 times. Six of the trials presented were compound stimuli, or Sam and Joe paired with the company meeting the production goal (AX+). Following thereafter were six target stimuli or test trials with the worker Joe paired with company meeting the production goal (X+). Because blocking is a between groups phenomenon, groups 2 and 3 differs from group 1, such that, there was no exposure to the blocking stimulus, or no (A+) trials were presented.

Group 3 - Control (B-/AX+ Control). Group 3 served as a control group for the amount of information provided the subjects in Group 1. As in Group 1 the antecedent and consequent stimulus were presented a total of 18 times. However, six non reinforced or neutral trials presented the worker Ted (B-) paired with no company production report. Another six trials presented the compound stimuli or workers Sam and Joe (AX+) paired with the company meeting its production goal. The remaining six trials were test trials, and presented the target worker Joe (X+) paired with the company meeting its production goal. The twelve trials including the neutral conditioning trials (B-) and the compound conditioning trials (AX+) were randomly interspersed, followed by six test trials, or six (X+) trials. No blocking stimuli or (A+) trials were presented.

Note: For the blocking (A+), compound (AX+), and target stimuli (X+) conditions described for each group, the levels of production (i.e. 650, 700, 750) were presented twice in a randomized order.

RESULTS

The analyses focused on the subjects' ratings of each "employees" causal strength and the subjects' confidence in their causal judgement. Recall that both dependent variables were measured on a 0 to 100 point scale across a series of test trials. In order to examine the hypothesized acquisition effects, a simple repeated measures was performed on causal ratings provided by subjects in groups 1 and 3. And, to examine blocking effects, subjects' causal ratings of the target stimulus X (the worker named Joe), were examined by performing a 3 groups by 6 trials repeated measures ANOVA.

Causal Confidence Ratings. The validity of the primary measure, subjects' ratings of worker causal strength, is enhanced if it can be demonstrated that the ratings are not related to subjects' confidence in making the ratings. Hence, the confidence variable was analyzed first in order to eliminate possible confounds in subjects' causal judgements. Prior causal attribution research (Shanks & Dickinson, 1987) argued that the subjects' confidence in their judgement must be consistent regardless of experimental group assignment. If this consistency is not evident then their causal judgements may be an artifact of the judgement task and not the conditioning procedures.

Therefore subjects' are expected to be equally confident in their estimates of either high or low worker causal strength.

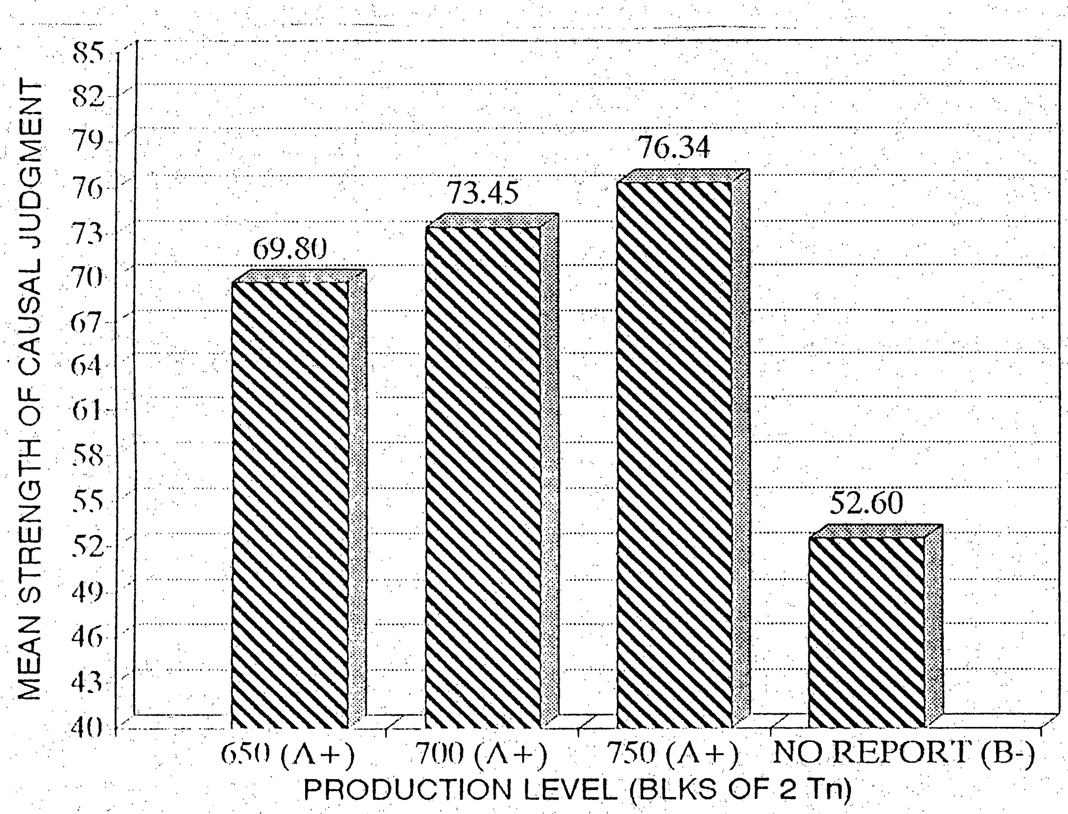
A 3 X 6 (Groups X Trials) repeated measures ANOVA was performed on subjects' confidence ratings of their estimates of the worker Joe's causal strength. Recall that the subjects' ratings of the worker Joe's causal strength is the primary variable for examining blocking effects. The group, trials, and interaction effects, were not statistically reliable. Groups, $\underline{F}$ (2,57) = < 1, $\underline{p}$ > .05, Trials, $\underline{F}$ (5,285) = < 1, $\underline{p}$ > .05, C X T, $\underline{F}$ (10,285) = 1.27, $\underline{p}$ > .05. As expected these results indicate that the subjects' confidence ratings were not affected by the experimental manipulations. Hence, variation in causal strength ratings were presumed to be due to the conditioning phenomena.

Acquisition/US Intensity. Usually, different groups in a conditioning experiment begin at a similar low level of performance, with differences in performance developing over the course of trials. Therefore, as a general rule, tests for rank order differences and differences in causal judgement ratings of various experimental groups are made late in learning over a block of the last few trials. In testing acquisition a simple repeated measures analysis was performed on the causal judgements for the blocking (A+) and neutral stimuli (B-), or for workers Sam and Ted, in Groups 1 and 3, respectively. Causal judgement to the blocking stimulus (A+) were significantly different across the trials, F (5,95) = 2.98, $p < .02$. As expected, simple repeated measures performed on the neutral stimulus (B-) across the trials did not reveal a significant effect F (5,95) = 1.93 $p > .05$.

An inspection of the blocking stimulus (A+) or worker Sam's causal rating mean scores revealed that subjects' were not responding as expected across the six repeated trials. That is, no increasing function (i.e., learning curve) was observed. At first glance, subjects appeared to be responding in a haphazard fashion. However, upon closer post hoc inspection the subjects were responding in a predictable manner. Recall that as part of the masking task, subjects rated the worker after being provided information about his level of production. Variation in the worker's level of monthly production was necessary in order to maintain mundane realism of the supervisor-worker masking task. When the means of the subjects' causal judgement scores were averaged in blocks of 2 trials pertaining to different levels of production (levels of US intensity) the data showed a familiar learning effect. (See Figure 1). As the subjects were exposed to increasing levels of production (US intensity) their averaged causal ratings increased

Figure 1

Mean causal judgement strength for the blocking stimulus, worker Sam (A+), and for the neutral stimulus, worker Ted (B-), in blocks of two trials by Groups 1 and 3.



correspondingly Pairwise comparisons, using a pooled error term were performed on blocks of 2 levels of intensity for subjects in Group 1. No differences were observed between blocks of 2 trials at intensity levels 650 and 700, (M = 69.80 vs M = 73.45), $\underline{t}(285) = 1.46$, $\underline{p} > .05$; and between levels 700 and 750, (M = 73.45 vs M = 76.34), $\underline{t}(285) = 1.52$, $\underline{p} > .05$. However, a significant range effect was observed when the lowest intensity, 650, was compared to the highest intensity, 750, (M = 69.80 vs 76.34), $\underline{t}(285) = 4.22$, $\underline{p} < .05$. As expected, in the no report condition (B-) mean causal ratings were lower compared to the ratings for all three levels of production paired with the single worker in Group 1. No direct statistical comparisons were performed because the A+ means are based on two trials of rating information, whereas, the information for the B- trials represent six test trials.

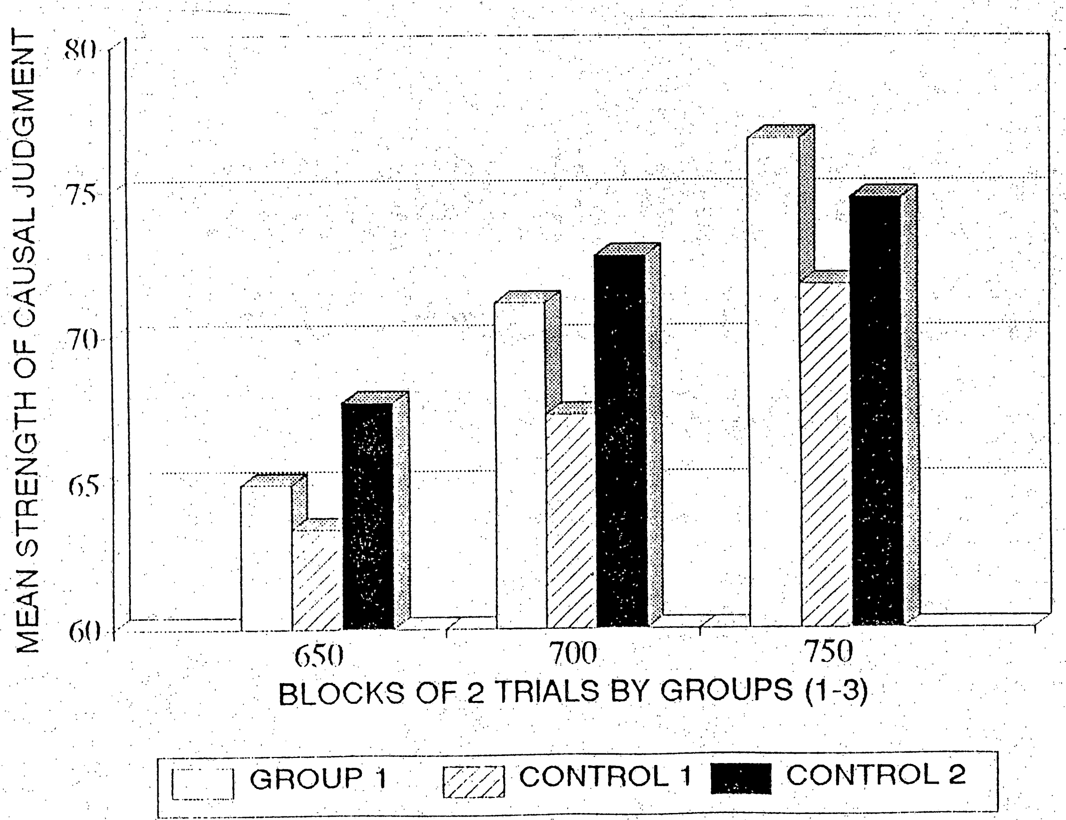
<u>Blocking</u>. Previous learning research has demonstrated that Blocking is a between groups phenomenon. Thus, in order to examine Blocking effects a 3 x 6 (Groups X Trials) Manova was performed on subjects' causal ratings of the target worker X. The groups were not statistically reliable, condition $\underline{F}$ (2, 57) = < 1, $\underline{p} > .05$, However, the trials and C X T were significantly different, Trials, $\underline{F}$ (5, 285) = 7.17 $\underline{p} < .05$; C X T, $\underline{F}$ (10, 285) = 6.46 $\underline{p} < .05$.

In examining worker (Joe) or target (X+) means by group in blocks of two trails across production levels revealed a systematic trend. As the US or intensity level increased, the subjects causal ratings increased correspondingly (See Figure 2).

A pairwise comparison (one-tail) was performed on the blocks of trials in Groups 1 - 3 over the three levels of production. No differences between the groups at each intensity was observed, $p > 05$.

Figure 2

Mean causal judgement strength for the target stimulus, worker Joe (X), by Groups 1 to 3.



DISCUSSION

Isolating critical variables in earlier attribution research was essential in developing a foundation from which further hypothesis were to be derived. However, the philosophy born from the British Associationist era was the adopted underpinnings of earlier attribution research and has been slow to change with more contemporary views of associationism. For example, earlier attribution principles argued that an effect is attributed (causal judgement) to one of its possible causes with which, over time, it covaries. The present research attempted to extend this concept by examining how social causal judgements acquire strength resulting from repeated presentations of events. This research adopts a more current approach regarding the mechanisms of associationism underlying social causal judgements by employing contemporary learning theory and paradigms. In fact, Shanks and Dickenson (1987) argued that the only area of psychology that has offered an associative account of a process sensitive to causality is that of conditioning (p. 230). Based upon contemporary conditioning models, we generated hypotheses to test acquisition and blocking effects in social causal judgements and/or attributions.

The objective of the present research was to use a contemporary learning model to experimentally test hypotheses in attribution using conditioning variables and analogous variables in social psychology. As part of a programmatic approach in examining human social causal judgements, the present study extended current thinking on complex attributional processes by taking into account the role of situational variables or context within which human causal judgements are made. Historically, causal attribution research has provided only limited explanations for how the individual renders a causal judgement when multiple causes are present. In addition, previous attribution research has utilized descriptive research designs whereby subjects are processing causal judgements in an all-or-none fashion. The present study examined how causal judgements regarding multiple plausible causes are developed over time.

Causal Confidence Ratings. Previous research (Shanks and Dickenson, 1987) illustrated the importance of demonstrating that the results obtained in learning-analog studies (acquisition) should not be an artifact of the rating procedure. They argued that the rating scale in conditioning research may encourage subjects to confound their assessment of causality with some other judgement feature of the task when making the rating. For example, the subjects' confidence in making a particular rating may confound their judgments of causality. In order to test for this possible confound, the present research examined confidence ratings on a 0 to 100 point scale with all stimulus presentations. Consistent with our prediction, subjects' confidence ratings on the target stimulus (worker Joe's) causal strength did not vary significantly as a function of different group manipulations. Thus, subjects were capable of making orderly judgements of confidence during the causal rating task. Ruling out this potential confound, Shanks and Dickenson argued, provides support for an associative learning model of causal judgment strength.

<u>Acquisition Effects</u>. When a subject is exposed to a conditioning procedure, conditioned responses do not typically start occurring at full strength, but, begin at a lower level of strength and progressively increase in strength until an asymptotic level is reached (acquisition). The present study examined acquisition effects by pairing a single worker with information regarding a company's level of goal production over repeated trials. Measuring the strength of the conditioned response was assessed using the subjects' causal strength ratings for workers Sam (A+ = rewarded trials) and Ted (B- = non rewarded trials).

Although causal ratings for the worker (A+) were significant across six trials in causal strength for Group 1, visual inspection of the causal strength means did not reveal the anticipated negatively accelerated acquisition curve. However, when the worker (A+) means were averaged in blocks of two trials for each specific goal production level predictable learning effects were evidenced. As the level of production increased from 650 to 750, subjects causal judgement scores increased correspondingly and were higher than causal judgements made to the worker (B-) paired with no reinforcement (no information about the company's production level). Such an effect would be expected based on the assumption that changes in production levels were analogous to changes in the intensity or magnitude of a learning unconditioned stimulus (see Rule of Correspondence #10). The subjects were responding to the intensity of the US or the company's level of production. The more intense the US (company goal), the higher the mean causal priority was given to the worker (See Figure 1).

The present study provided subjects with different information on production levels in order to establish mundane realism. Such a procedure would be unnecessary when using non-human subjects in a classical conditioning paradigm. However, human subjects would become suspicious if the company's production level remained constant across the evaluation cycles. We did not anticipate that the subjects would attend to only slight increments and decrements in the (US) or company production level. In retrospect, the subjects took very seriously the instructional set and the masking task. They played their role as supervisors extremely well. And, although the acquisition data did not conform to expectations the results are not without logic.

Intensity effects like those observed in Figure 1 indicate that a simple contiguity model for causal attribution could not provide a complete explanation. If the pairing of a worker (CS) and a company production level (US) is <u>all</u> that is required for the development of causal attribution strength then no production level intensity effects would be expected. Traditional social psychological or "rule governed" explanations describing causal priorities like Kelley's <u>covariation principle</u>, also do not easily explain intensity effects. Based upon the present results, it appears that subjects are evaluating the informativeness of stimuli and are making selective causal judgements based upon that information. The above discussion is admittedly post hoc, but, Williams (1994) has demonstrated that varying the contingency between CS and US, and thus challenging the simple contiguity approach in the evaluation of human causal judgements, produces systematic outcomes.

<u>Blocking Effects</u>. In Group 1 subjects were expected to give lower causal ratings to the target worker (Joe) because of their prior experience with another worker (Sam) who was

a reliable predictor of the company's production level. Learning psychologists argue that since antecedent stimulus or a first worker already reliable predicts the outcome, the target stimulus or in the present case a second worker will become redundant (e.g. Wagner & Rescorla, 1972). Therefore, the worker which initially was associated with the outcome (e.g. company level of production) will be given higher causal priority than a second worker although paired with the same outcome (e.g. level of production) because this information is redundant. Hence, causal attributions to the second worker are expected to be blocked. In the present research blocking effects were not observed. However, in the present research the target worker was <u>not</u> redundant. Because of the necessary changes in the company's level of production the second worker actually predicted different outcomes. Arguably, such a procedure is not appropriate for studying blocking. In fact, when a target stimulus is paired with an increase in the US strength (higher company production level) a phenomenon know as unblocking can be expected. Unblocking would be expected to result in stronger, not weaker, causal attribution to the target worker. Therefore, the procedure designed to produce mundane realism may have produced the unexpected outcomes.

<u>Boundary Conditions</u>. In general, the results from theory-generated research, and in particular, the results

from the present study, should be interpreted within a narrow range of conditions (Logan, 1959). The general method from the present study serves as an explicit statement for some of the boundary conditions, particularly in regard to the discrete-trials procedure, the conditioning of a single response, the control of competing responses, and the choice of dependent variable. Typically, social psychological attribution research regarding the strength of human causal judgments utilize descriptive events of social action rather than presenting information about social behavior over time. For example, subjects are given a descriptive account of some social action (like a vignette) and then asked to make an attribution "all-or-none" based upon the information from this single observation. However, the present study, which was concerned with conditioning and contextual variables in social causal attributions, examined how multiple presentations of antecedent and consequent stimuli effect social causal judgements over time. The potential context effects <u>suggested</u> here may generalize only to situations where information is presented repeatedly rather than to descriptive accounts of social action. However, the conditioning strategy tested and reported on here have a broader application than the unusual experimental procedure seems to imply. For example, conditioning analogies from both instrumental and Pavlovian learning models have successfully been used to study a variety of social phenomena: altruism (Weiss, Buchanan, Alstatt, & Lombardo 1971); attitudes (Weiss, 1962); attraction (Cramer, Weiss, Steigleder, & Balling, 1985); competition (Steigleder, Weiss, Cramer, & Feinberg, 1978); and male sex role action (Cramer, Lutz, Bartell, Dragna, & Helzer, 1989). Rather than appealing to only a narrow range of learning phenomena, the research strategy described here may serve to strengthen and extend previous findings regarding human causal judgements.

Research boundary conditions can also be established by recognizing disanalogies between important learning variables and theoretical analogous social variables. For example, in learning psychology conditioning is presumed to follow from the use of neutral discriminable antecedent stimuli. We know that conditioning is retarded when putative conditioned stimuli are familiar to the subject by preexposure or by a preexisting conditioning history. The present study assumed that the human employees about which the subject had only scant knowledge were analogous to discriminable neutral antecedent stimuli in conditioning research. However, the present results argue that such an assumption may not be valid. The argument is based upon data provided by subjects in Group 3 (i.e. subjects receiving non reinforced or B- trials). Theoretically, the strength of causal attributions to a worker not paired with company production information should not appreciably increase. In other words, presenting an antecedent stimulus without presenting an effect should not result in causal attributions to the antecedent stimulus. In Group 3, however, causal judgement strength averaged a mean score of 52.60 on a 100 point scale. Arguably, human or human representations (employees) do not serve as neutral antecedent stimuli. That is, humans are "at cause" by being "at cause", and estimates of their contribution to an effect can vary, but, will not be negligible.

Another implication of the humans are "at cause" phenomenon is that conditioning of causal attributions may not begin at or near zero in strength. Recall that in Group 1 and 2, subjects received a series of worker productivity pairings and were measured for their estimates of causal strength following each pairing. The average causal judgements in Group 1, for example, ranged between 60.80 to 76.34 for blocks of two trials. In no instance did the subjects give causal judgement ratings averaging at or near zero. In fact, the causal strength rating presented in Figure 1 may represent only increases from an unanticipated baseline of approximately 50. The baseline of 50 is derived from information provided by subjects in Group 3 (B-). The present study's acquisition and blocking effects may have been negatively effected by such a restricted range in conditionable causal judgement strength.

Implications For Future Research. Mapping learning research variables to social analogues in human causal judgements have yielded predictable outcomes (See William, 1994; Kuhn, 1993). However, in the present study the predicted learning phenomenon, acquisition and blocking, were not achieved, not because the variables were not tightly drawn (see Rules of Correspondence), but, because unanticipated effects may have developed as a function of the change in "saliency" of the US, and/or the company production goal always being met. Recall that in the present study subjects received information indicating that the company's production goal was always exceeded. They also received information indicating that the particular level of production varied across evaluation periods. The rationale for the latter information was to maintain mundane realism of the worker-supervisor masking task. In retrospect, variation in the production level information may have been important for making causal judgements because the company's production goal was always exceeded. Goal information, because it was not held constant, could not be used by the subjects for evaluation of the target worker, rather, the subjects were thoughtfully interpreting the production variations as a basis for causal judgement. This behavior on the part of the subjects would undermine the theoretical necessity of holding the US constant and observing the blocking effect. Further research must resolve the issues surrounding variation in the production effects or other US analogs.

Because humans may be "at cause" or are adept at discriminating between slight variations of stimuli in their environment, the interspersed trials procedure that the present research utilized may not have been the most appropriate protocol. Recall that earlier in the blocking procedure, subjects were presented with six trials of a single CS interspersed with 6 trials with a compound CS, followed by six trials of a single worker CS which served as a test for measuring causal judgement strength. As the results indicated, subjects who where exposed to the blocking group did not "block" or attenuate their causal judgement scores to the (novel) single worker in the compound. In essence, the (novel) single worker did not prove to be "redundant", but, on the different trials predicted a new outcome. Further research may consider using a phase conditioning procedure (Rescorla & Wagner, 1972) where each type of single stimulus and compound stimulus are grouped and presented in distinct phases. Utilizing this procedure coupled with eliminating the arbitrary goal may in fact be one solution for observing predictable effects in acquisition and blocking of social causal judgement.

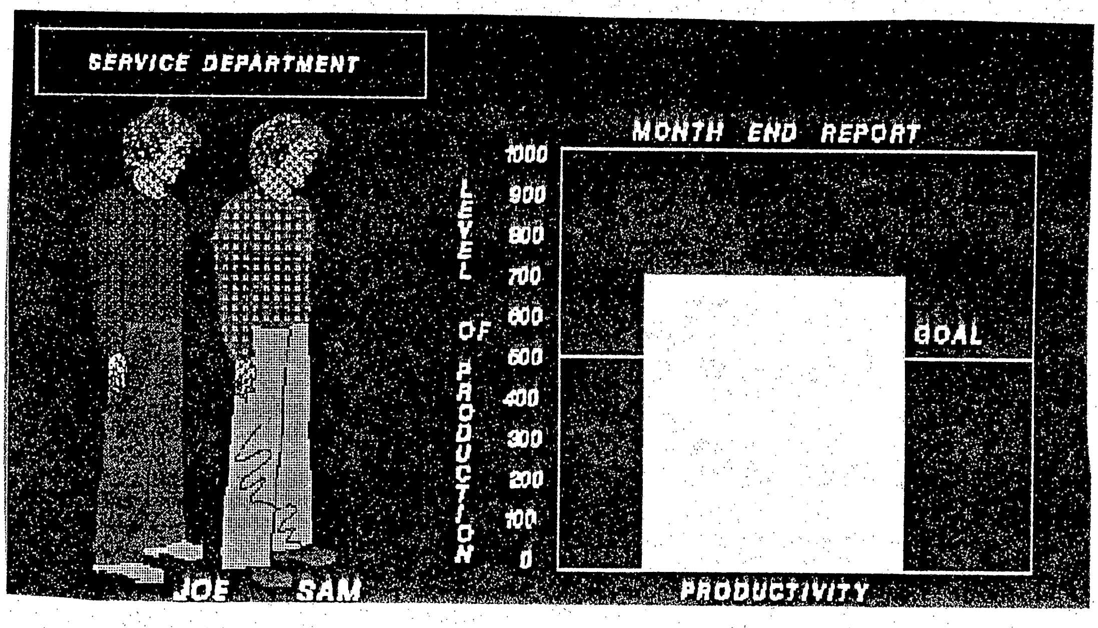
Clinical Applications. The influence of how multiple causes affect causal judgements over time may be applied to several social situations where human social exchange is implied in the rendering of some causal attributions. More specifically, any therapeutic approach and/or client-therapist relationship may be affected by how contextual variables are conditioned over time. For example, William (1994) demonstrated that multiple causes influencing causal judgements may follow from contemporary learning principles like acquisition and contingency (base-rate) effects. William suggested that "contingency effects" may parallel the client therapeutic relationship, such that the clinician's assessment (cause judgement) for a particular client may be biased when the client is present in an individual therapy session vs when the client is in a group therapeutic situation. Supporting Williams' point of view, Cline (1985) has argued that there is no general review of the impact of the clinical situation on clinical judgement, and has suggested that whether a client is interviewed alone or in his/her family group will significantly influence the interviewer's evaluation of his/her client.

Blocking of social causal judgements may be evidenced in any therapeutic setting as well. Psychiatric patients are at risk for suicide 3 to 12 times greater than that of non-patients. It has been reported that the degree of risk varies according to age, sex, diagnosis, and inpatient or outpatient status. More specifically, in a closed psychiatric facility, where patients are monitored routinely, suicides are reported more often among patients diagnosed with depression than individuals diagnosed with psychosis (Kaplan & Sadock, 1991). If there is no difference in documented patient observation records on the unit, then, why should such differential suicide rates be evidenced? It may be possible that "blocking" of patient observations is occurring. In other words, the inpatient staff who monitors the activities of psychiatric patients may be making differential observation rounds (or attributions) because of the saliency of the diagnosis. For example, let's say a psychotic suicidal individual (A+) is brought to a psychiatric hospital and is placed on routine observation rounds every fifteen minutes. Then, later in time, a depressed individual (X+) is also admitted to the hospital and placed on routine observations (AX+). Previous experience and threat to injury with the psychotic individual will alert health care professionals to observe the patient more closely than the depressed individual because the psychotic individual is the most salient stimulus. Attributions of suicidality to the depressed person is "blocked" because the depressed persons does not predict any threat (US). Hence, causal judgements (perceived threat) to the depressed individual is "blocked", therefore, the depressed person may go unnoticed and hence is more likely to successfully attempt suicide in a psychiatric facility.

APPENDIX A

Antecedent and Consequent Stimuli

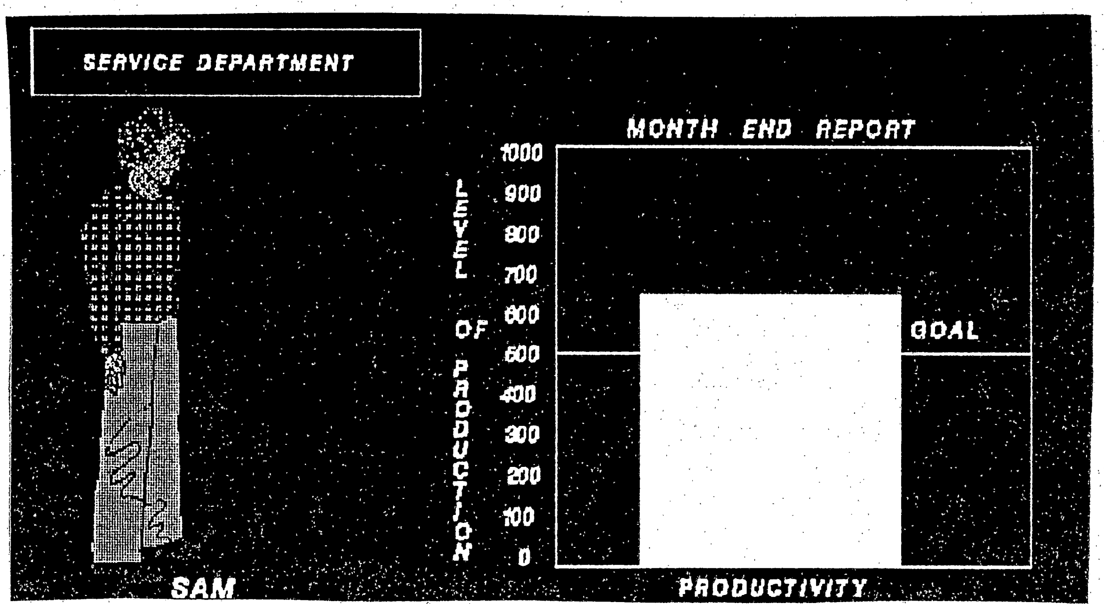
Compound stimulus Sam and Joe (AX+) and company production report.



Appendix A (cont'd)

Antecedent and Consequent Stimuli

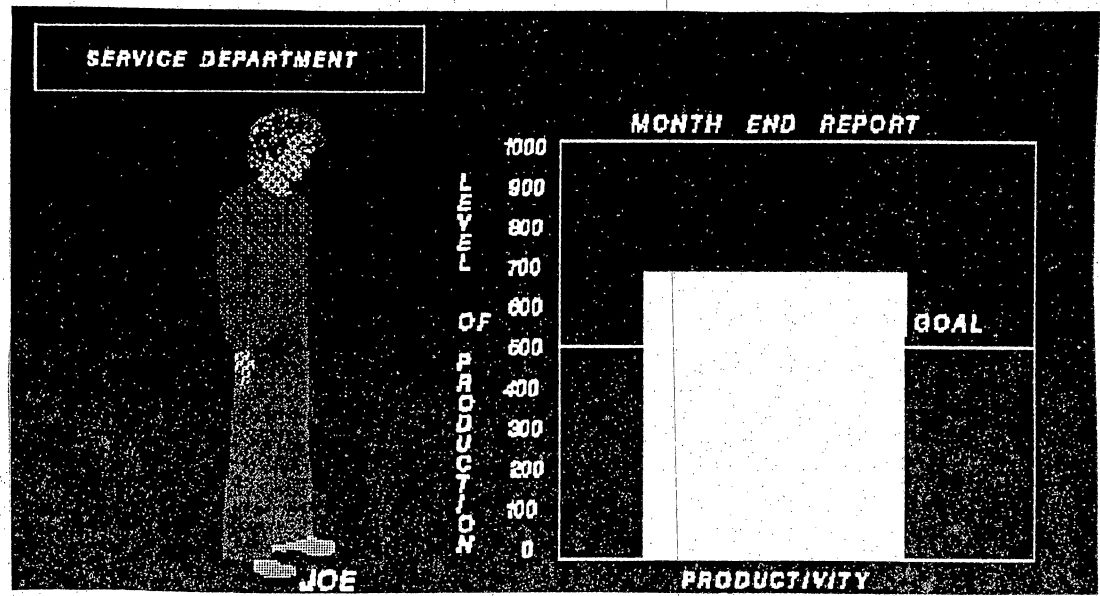
Blocking Stimulus Sam (A+) alone and company production report.



Appendix A (cont'd)

Antecedent and Consequent Stimuli

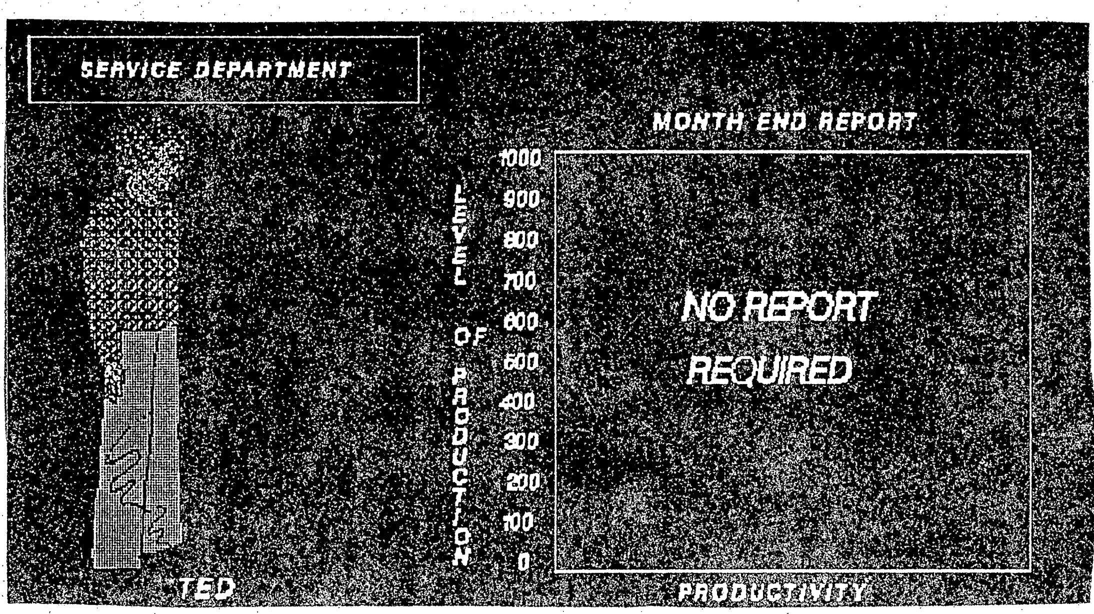
Target stimulus Joe (X+) alone and company production report.



Appendix A (cont'd)

Antecedent and Consequent Stimuli

Neutral stimulus Ted (B-) and no company production report.



APPENDIX B

Consent Form

EMPLOYEE EVALUATION SYSTEM

I am volunteering to participate as a subject in this study. I understand that the purpose of this study is to test the efficiency of a computerized employee evaluation system. I understand that the information will be presented to me via a computer monitor and that I will be asked to assume the role of a production supervisor in a large company.

I understand that my name will NOT be included in the experiment itself and that my anonymity will be maintained at all times. I also understand that my participation in this study is voluntary and that I may refuse to answer any questions at any time. I also understand that I may withdraw from this study at any time without penalty or prejudice. I also understand that any questions I may have regarding this study will be answered.

I understand that all the information collected in this study will be treated as confidential with no details about my responses released to anyone outside the research staff without my separate and specific written consent.

I understand that I may derive no specific benefit from participation in this study, except perhaps from feeling that I have contributed to the development of psychological knowledge.

I hereby allow this research group to publish the results of this study in which I am participating, with the provision that my name and/or other identifying information be withheld.

This study is being conducted by psychology students under the supervision of Dr. Robert Cramer, PS-211, extension 5576. I understand that if I have any questions or concerns about the study or the informed consent process I may also contact the Psychology Department Human Subjects Review Board at CSUSB.

Participants Signature:____________________ Date_________

Participants Name (Printed):______________________________

APPENDIX C

Instructions for Group 1

Experimenter Note:
(6 A+, 6 AX+, 6X+ Blocking group)

Practice Script

Read when worker(s) appear: "On the left side of the screen will be a picture representing one part-time employee, Sam or Joe, or two part-time employees Sam and Joe."

Read when the graph appears: "On the right side of the screen is a graph depicting the company's monthly productivity."

"Are there any questions?"

Have subjects press 1 to continue.

Note: A set of instructions appears for the subjects to read. Read it aloud as the subjects follow along on the computer.

"Following each monthly productivity report you will be asked to rate the employees on their OVERALL performance on a "0 to 100" point scale. After reading each item carefully please respond by using the numeric keypad on the right side of the keyboard. After entering any number between "0 to 100" (including 100) please wait for the next evaluation item to appear."

(Wait until screen changes to first evaluation item)

Read: "After reading the item for practice, please press 50 and wait for the next evaluation item to appear"

(Wait until screen changes to second evaluation item)

Read: "Please answer 111 for this item. This is to demonstrate what will happen if you enter a number over 100. If this warning appears any time during the evaluation cycle, put in the corrected number and wait for the next screen to appear. Please do not enter any number for the last question during this practice session."

Note: When you are ready to begin, please press 1.

Appendix C (cont'd)

Instructions for Group 2

Experimenter Note:
(6 AX+, 6X+ Control group 2)

Practice Script

Read when worker(s)appear: "On the left side of the screen will be a picture representing either two part-time employees, Sam and Joe or one part-time employee Joe."

Read when the graph appears: "On the right side of the screen is a graph depicting the company's monthly productivity."

"Are there any questions?"

Have subjects press 1 to continue.

Note: A set of instructions appears for the subjects to read. Read it aloud as the subjects follow along on the computer.

"Following each monthly productivity report you will be asked to rate the employees on their OVERALL performance on a "0 to 100" point scale. After reading each item carefully please respond by using the numeric keypad on the right side of the keyboard. After entering any number between "0 to 100" (including 100) please wait for the next evaluation item to appear."

(Wait until screen changes to first evaluation item)

Read: "After reading the item for practice, please press 50 and wait for the next evaluation item to appear"

(Wait until screen changes to second evaluation item)

Read: "Please answer 111 for this item. This is to demonstrate what will happen if you enter a number over 100. If this warning appears any time during the evaluation cycle, put in the corrected number and wait for the next screen to appear. Please do not enter any number for the last question during this practice session."

Note: When you are ready to begin, please press 1.

Appendix C (cont'd)

Instructions for Group 3

Experimenter Note:
(6 B-, 6 AX+, 6 X+, control group 3)

Practice Script

Read when worker(s) appear: "On the left side of the screen will be a picture representing part-time employees, Joe or Ted or two part-time employees Sam and Joe."

Read when the graph appears: "On the right side of the screen is a graph depicting the company's monthly productivity. During an evaluation cycle it is possible a blank graph would appear when no report was required. If this occurs it is important that you continue to rate the employees on their OVERALL performance."

"Are there any questions?"

Have subjects press 1 to continue.
Note: A set of instructions appears for the subjects to read. Read it aloud as the subjects follow along on the computer.
"Following each monthly productivity report you will be asked to rate the employees on their OVERALL performance on a "0 to 100" point scale. After reading each item carefully please respond by using the numeric keypad on the right side of the keyboard. After entering any number between "0 to 100" (including 100) please wait for the next evaluation item to appear."

(Wait until screen changes to first evaluation item)

Read: "After reading the item for practice, please press 50 and wait for the next evaluation item to appear"

(Wait until screen changes to second evaluation item)

Read: "Please answer 111 for this item. This is to demonstrate what will happen if you enter a number over 100. If this warning appears any time during the evaluation cycle, put in the corrected number and wait for the next screen to appear. Please do not enter any number for the last question during this practice session."

Note: When you are ready to begin, please press 1.

APPENDIX D

Debriefing Statement

The present study is part of a series of research projects designed to investigate human social causal judgments. Unfortunately, in order to adequately investigate this social phenomenon a small deception of the subjects was necessary. Rather than directly asking questions concerning your social causal judgments, we explained the study as testing the efficiency of a computerized Employee Evaluation System. The company, its employees, and the evaluation system were fictitious. We apologize for this deception, however if we had asked directly about your causal judgments your responses may have been effected.

(Stop. Are there any questions?)

It is our sincere hope that the necessity for deception is understood. It is important for the completion of this study that you do not speak with other students on campus about your experience here today. If other potential subjects are aware of the purpose of the experiment, the results of the study might be compromised.

The present study conforms to the ethical principles established by the American Psychological Association. We are interested in obtaining your comments or reaction regarding your participation in our experiment. This information would serve as a basis for checking and evaluating the quality and care with which our research is conducted. Please feel free to comment or ask questions. For results concerning the present study contact Dr. Robert Cramer, at (909) 880-5576.

REFERENCES

Alloy, L. B., & Tabachnik, N. (1984). Assessment of covariation by humans and animals: The joint influence of Prior Expectations and current situational information. Psychological Review, 91(1), 112-149.

Bunge, M. (1979) Causality and Modern Science. New York: Dover Publications, Inc.

Buss, A. (1978) Causes and reasons in attribution theory: A Conceptual Critique. Journal of Personality and Social Psychology, 36(11), 3111-1321.

Chapman, G. B. (1991). Trial order affects cue interaction in contingency judgment. Journal of Experimental Psychology: Learning, Memory, and Cognition (in press).

Chapman, G. B., & Robbins, S. J. (1990). Cue interaction in human contingency judgement. Memory and Cognition, 18 537-545.

Cline, T. (1985). Clinical judgement in context: a review of situational factors in person perception during clinical interviews. Journal of Child Psychology and Psychiatry and the Allied Disciplines, 26, 369-380.

Cramer, R. E., Weiss, R. F., Steigleder, M. K., and Balling, S. S. (1985). Attraction in context: acquisition and blocking of person-directed action. Journal of Personality and Social Psychology, 49, 1221-1230.

Cramer, R. E., Lutz, D. J., Bartell, P. A., Dragna, M., and & Helzer, K. (1989) Motivating and reinforcing functions of the male sex role: social analogues of partial reinforcement, delay of reinforcement, and intermittent shock. Sex Roles, 20, 551-572.

Dickenson, A., Shanks, D. R., & Evenden, J. L. (1984). Judgment of act-outcome contingency: The role of selective attribution. Quarterly Journal of Experimental Psychology, 36A, 29-50.

Duval, S., & Duval, V. (1983). Consistency and Cognition - A Theory of Causal Attribution. Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Davidson, D. (1967) Causal relations, Journal of Philosophy, 64, 685-700.

Einhorn, H., & Hogarth, R. (1986). Judging probable cause. Psychological Bulletin, 99, 3-19.

Garcia, J., & Koelling, R. A. (1966). Relation of cue to consequence in avoidance learning. Psychonomic Science, 4, 123-124.

Jones, E. E., & Davis K. E. From acts to dispositions: The attribution process in person perception. In L. Berkowitz (Eds.), Advances in experimental social psychology (Vol. 2). New York: Academic Press, 1969.

Harre, R. (1972). Philosophers of science, Oxford England: Oxford University Press.

Harvey, J. J., & Weary G. (1981). Perspectives on attributional processes. Dubuque, Iowa: Wm. C. Brown Company Publishers.

Hewstone, M. (1989). Causal attribution. Cambridge Massachusetts: Basil Blackwell Inc.

Heider, F. (1958). The psychology of interpersonal relations. New York: John Wiley & Sons.

Heider, F. (1973). Gestalt theory: Early history and reminiscence. In M. Henle et al. (eds), Historical conceptions of psychology, New York: Springer.

Hume, D. (1969). Treatise of human nature (edited by T.V. Smith and Marjorie Grene). Chicago: University of Chicago Press. (Originally published in 1739)

Kamin, L. J. (1968). "Attention-like" processes in classical conditioning. In M. R. Jones (Ed.), Miami symposium on the prediction of behavior 1967 Aversive stimulation (pg. 9-31). Coral Gables, FL: University of Miami Press.

Kamin, L. J. (1969). Predictability, surprise, attention, and conditioning. In B. A. Campbell & R. M. Church (Eds.), Punishment and aversive behavior (279-296). New York: Appleton-Century-Crofts.

Kant, I. (1965) Critique of pure reason. New York: Macmillan. (Originally published 1781.)

Kaplan, H. I., & Sadock, B. (1991). <u>Synopsis of psychiatry: Behavioral sciences clinical psychiatry</u>. Baltimore: Williams & Wilkins.

Kelley, H. H. (1967). Attribution theory in social psychology. In D. Levine (Ed.), Nebraska symposium on motivation (Vol. 15) (pg. 192-240). Lincoln: University of Nebraska Press.

Kelley, H. H. (1972). Causal schemata and the attribution process. In e. E. Jones, D. E. Kanouse, H. H. Kelly, R. E. Nisbet, S. Valins & B. Weiner (Eds.), Attribution: Perceiving the causes of behavior (pg.151-174). Morristown, NJ: General Learning Press.

Kelley, H. H. (1973). The process of causal attributions. <u>American Psychologist</u>, <u>28</u>, 107-128.

Kelley, H. H. & Michela, J. L. (1980). Attribution theory and research. <u>Annual Review of Psychology</u>, <u>31</u>, 457-501.

Kuhn, J. (1993). An Investigation In Cue-to-Consequence Like Effects In An Associative Account of Causal Attributions. Unpublished Thesis. California State University, San Bernardino.

Logan, F. A. (1959) The Hull-Spence approach, In S. Koch (Ed.), Psychology: A study of a science Vol. 2, New York: McGraw-Hill

Mackintosh, N. J. (1974). The psychology of animal learning. New York: Academic Press.

Medcof, J. W. (1990). PEAT: An integrative model of attribution processes. <u>Advances in Experimental Social Psychology</u>, <u>23</u>, 111-209.

Michotte, A. E. (1946). La perception de la causalite. Paris: J. Vrin; translated as The perception of causality. New York: Basic Books, 1963.

Mill, J. D. (1973 Eds). System of logic (8th Eds). In J. M. Robson (ed.), Collected works of John Stuart Mill (Vols 7 and 8). Toronto, Canada: University of Toronto Press. (Original work published in 1872).

Miller, N. (1959) Liberalization of basic S-R concepts: extensions to conflict behavior, motivation and social learning. In S. Koch (Ed.), Psychology: A study of science (Vol.2, pg 196-292). New York: McGraw-Hill.

Nagel, E. (1961) The structure of science. New York Harcourt, Brace & World.

Oppenheimer, R. (1954) Analogy in science. American Psychologist, 11, 127-135.

Piaget, J. (1930). The child's conception of physical causality. London: Routhledge.

Rescorla, R. A. (1988) Pavlovian conditioning: it's not what you think it is. American Psychologist, 43 (3), 151-160.

Rudy, J. W., & Wagner, A. R. (1975). Stimulus selection in associative learning. In W. K. Estes (Eds.), Handbook of learning and cognitive processes (Vol, 2, pg. 269-303). Hillsdale: NJ: Erlbaum.

Seligman, M. (1970). On the generality of the laws of learning. Psychological Review, 77, 406-418.

Shanks, D. (1987). Associative accounts of causality judgment. The Psychology of Learning and Motivation, 21, 229-261.

Shanks, D.(1987). Acquisition functions in contingency judgment. Learning and Motivation, 18, 147-166.

Shanks, D. (1989). Selectional processes in causality judgment. Memory & Cognition, 17(1), 27-34.

Schultz, T. (1982) Rules of causal attribution. Monographs of the Society for Research in Child Development, 47, 1-49.

Schwartz, B. (1989). Psychology of learning and behavior. New York: W.W. Norton.

Staats, A. W. (1975). Social behaviorism. Homewood, IL:Dorsey Press.

Steigleder, M. A., Wiess, R. F., Cramer, R. E., & Feinberg, R. A. (1978) Motivating and reinforcing functions of competitive behavior. Journal of Personality and Social Psychology, 36, 1291-1301.

Taylor, S. E. (1981). The interface of cognitive and social psychology. In J.H. Harvey (ed.) Cognition, social behavior and the environment. Hillsdale, NJ: Erlbaum.

Wagner, A. R., & Logan, F. A., Halberlandt, K., & Price, T. (1968) Stimulus selection in animal discrimination learning. Journal of experimental psychology, 76, 171-180.

Wagner, A. R., & Rescorla, R. A. (1972). Inhibition in Pavlovian conditioning: Applications of a theory. In R. A. Boakes & M. S. Halliday (Eds.), Inhibition and Learning (pg. 301-339). New York: Academic Press.

Wasserman, E. A. (1974). Stimulus-reinforcer pred-ictiveness and selective discrimination learning in pigeons. Journal of Experimental Psychology, 103, 284-297.

Wasserman, E. A. (1990). Attribution of causality to common and distinctive elements of compound stimuli. Psychological Science, 5, 298-302.

Weary, G., Stanley, M.A., & Harvey, J. H. (1989) Attribution. New York: Springer-Verlag Inc.

Weiss, R. F. (1962) Persuasion and the acquisition of attitudes: models from conditioning and selective learning. Psychological Reports, 11, 709-732.

Weiss, R. F., Buchanan, W., Alstatt, L., Lombardo, J. P. (1971). Altruism is rewarding. Science, 171, 1262-1263.

William, R. S. (1994) Contingency-like effects in an associative account of invariance seeking action. Unpublished Thesis. California State University, San Bernardino.